



national accelerator laboratory

TM-477
2254

UPGRADING THE M6 BEAM LINE FOR 280 GeV OPERATION

G. A. Weitsch

April 5, 1974

The M6 beam line in the Meson Area is designed both for high intensities (2.5 mr production angle) and for high momentum resolution ($\pm 0.03\%$). The basic design was made at a time when 200 GeV protons were expected at the Meson Area target; hence, the maximum of 200 GeV for the M6 line. Since then, 300 GeV operation has become standard for the Meson Area and the other charged particle beam lines M1 and M2 were upgraded correspondingly. The neutral beam lines, M3 and M4, did not require any changes, leaving only the highest quality beam, M6, limited to 200 GeV. Improving M6 for higher energy is made difficult and complicated by the already quite high density of components needed to achieve the high performance and the constraints imposed by the long straight sections in steel pipes through the earth muon absorber.

In this note a possibility is pointed out for upgrading M6 to 280 GeV operation without losing the other properties of the beam design. 280 GeV is a compromise between technical complications (no superconducting elements, minimum amount of alterations) and the desire to reach the highest possible energies. Since it is unlikely that the incident proton beam energy will be higher than 300 GeV for some time, this compromise limit of 280 GeV in the M6 line seems reasonable.

Only the recombined mode of the east branch of M6 which feeds the Single Arm Spectrometer (SAS) is studied here. The dispersed mode differs slightly in the tune of quadrupoles (M6Q8, M6Q9, M6Q10A) and represents, therefore, no additional problems. Similarly the 280 GeV beam could be switched, as now, to the west branch by powering 2 bends (M6B10, M6B11) differently. Not included here is the upgrading for the SAS, and experiments in the west branch. These questions should be solved separately, depending on the experiments supposed to run in the future.

The details of the new design are documented in the appended layout sheet and transport run.

Main Features

The production angle and beam angle at all 3 foci are unchanged, as well as their z locations. Only the second focus moves 4 inches east, the others staying exactly where they are now. In the optics the point to parallel to point focusing is maintained, and magnifications, dispersion, momentum resolution, and the accepted phase space are virtually the same as before.

As a drawback one must consider the loss of the 48 ft long parallel region around 1250 ft suited for a differential Cerenkov counter. The horizontal and vertical collimators (aperture stops) in the first stage appear

to be no serious loss. The second stage now has a vertical stop and has space for a horizontal stop also, and in the first stage there would be space for 2 collimators if one is willing to custom-tailor them. The vernier M6V2 (horizontal) in the first stage disappeared, but this is not crucial since the bend magnets will have to be powered separately in the first stage eliminating the need for trimming with M6V2.

Additional Elements

- a. M6B9A and M6B9B, two 20' B2 magnets between B9 and B10 in the third stage.
- b. M6B6A, an 8' B2 magnet downstream of M6B6 (if separately powered, it could be also 10' long) in the second stage.
- c. M6B3A, a 20' B2 magnet added in the first stage.
- d. M6B2AS, a 10' septum magnet (exists).
- e. M6Q1A, M6Q13A, two additional 3Q60 quadrupoles in the first and third stages, respectively.

Necessary Movements of Existing Components

- a. Q1-Q4 and B3-B5 have to be repositioned.
- b. Q7, B6, Q8, Q9 move 6 to 12 ft further downstream (including verniers and sextupoles in this region).
- c. All elements between Q10A and B11 move up to 4 inches to the east.

Minor Problems

The presently existing 3" quadrupoles have a limit of 7.5 kG at 1.5" radius, set by total power dissipation (and field quality). Q1, Q2, Q3, and Q4 will all run somewhat harder, up to 8.17 kG at 280 GeV. This could not be avoided by repositioning the quads. Possible alternatives might be better cooling or an improved quad design with higher gradient. Running the first stage in a point-to-point mode to achieve lower quad excitations seems very unattractive since both the solid angle and the momentum acceptance would be seriously degraded.

A similar high field is required in M6Q11, but here one can increase the spacing between the quads, or replace M6Q11 with a 10 ft quad and avoid the trouble. The only other trouble spots are the field lenses M6Q5 and M6Q10, where a 3" aperture is limiting the momentum acceptance severely and a larger bore quad would be advantageous. However, the existing M6 line suffers the identical momentum acceptance limit. Both M6B3 and M6Q1 will be moved further upstream by a small amount and, therefore, closer to the neutral beam line. A small amount of machining off the corners of these magnets may be necessary.

Power Requirements

The new M6 line, including the present SAS, would consume

about 4.0 MW compared to 2.8 MW now at maximum energy. These figures do not include bus losses and additions for saturation and heating of the magnets. The second and third stage of M6 can be powered by the existing installed supplies in the West Alcove. Upgrading the SAS in addition is likely to exceed the total power limit of the substation for the West Alcove. Two additional groups of Transrex power supplies would be needed in Service Building MS21 to power three septum magnets and four 20' B2 magnets, adding substantially to the demand in this service building.

In summary, upgrading of the M6 line seems a feasible project without many severe problems, and a maximum energy of 280 GeV can be achieved without resorting to special new magnet designs or superconducting technology.

M6 UPGRADED FOF	280	GeV/c						
* THETA 0*	16.							
* R.E.A.*	1.							
0.0	0.0	0.0	0.0	FT	0.0	FT		
					0.0	0.050 CM		
					0.0	0.700 MR	0.0	
					0.0	0.051 CM	0.0	0.0
					0.0	0.650 MR	0.0	0.0
					0.0	0.0 CM	0.0	0.0
					0.0	1.000 PC	0.0	0.0
* R.PTAT*	3.				30.74998 FT			
					0.0	1.724 CM		
					0.0	0.700 MR	1.000	
					0.0	1.601 CM	0.0	0.0
					0.0	0.650 MR	0.0	0.0
					0.0	0.0 CM	0.0	0.0
					0.0	1.000 PC	0.0	0.0
* Z R0*	20.				180.00000 DEG			
					0.0	1.724 CM		
					0.0	0.700 MR	1.000	
					0.0	1.601 CM	0.000	0.000
					0.0	0.650 MR	0.000	1.000
					0.0	0.0 CM	0.0	0.0
					0.0	1.000 PC	0.0	0.0
* PCTAT*	2.				0.09339 DEG			
					0.0	1.724 CM		
					0.0	0.700 MR	1.000	
					0.0	1.601 CM	0.000	0.000
					0.0	0.650 MR	0.000	1.000
					0.0	0.0 CM	0.0	0.0
					0.0	1.000 PC	0.0	0.0
* REND*	4.	"BLS"	10.25000 FT		9.75000 KG	0.0		0.18687 DEG)
					0.0	1.942 CM		
					0.0	0.701 MR	0.999	
					0.0	1.804 CM	0.000	0.000
					0.0	0.650 MR	0.000	1.000
					0.0	0.006 CM	-1.000	-0.999
					0.0	1.000 PC	0.003	0.047
* RNTAT*	2.				0.09339 DEG			
					0.0	1.942 CM		
					0.0	0.701 MR	0.999	
					0.0	1.804 CM	0.000	0.000
					0.0	0.650 MR	0.000	1.000
					0.0	0.006 CM	-1.000	-0.999
					0.0	1.000 PC	0.003	0.047
* Z F0*	20.				-180.00000 DEG			
					0.0	1.942 CM		
					0.0	0.701 MR	0.999	
					0.0	1.804 CM	0.000	0.000
					0.0	0.650 MR	0.000	1.000
					0.0	0.006 CM	-1.000	-0.999
					0.0	1.000 PC	0.003	0.047

TOPIFT

3. 1.75000 FT

0.0	0.254	-0.000	92.750 FT	92.750 FT	0.0	1.980 CM	0.999
0.0					2.0	0.701 MR	
0.0					0.0	1.838 CM	-0.000
0.0					0.0	0.650 MR	-0.000
0.0					0.0	0.706 CM	1.000
0.0					0.0	1.000 DC	-0.000
0.0					0.0	-0.003	-0.047
0.0					0.0	0.000	0.000
0.0					0.0	-0.000	-0.001

Z RPT

3.	0.254	-0.000	92.750 FT	92.750 FT	0.0	1.980 CM	0.999
					0.0	0.701 MR	
					0.0	1.838 CM	0.000
					0.0	0.650 MR	0.000
					0.0	0.006 CM	1.000
					0.0	-1.000 -0.599	-0.000
					0.0	0.003 0.047	0.0 -0.001
					0.0	0.000	

180.00000 DEG

20.	0.254	-0.000	92.750 FT	92.750 FT	0.0	1.980 CM	0.999
					0.0	0.701 MR	
					0.0	1.838 CM	0.000
					0.0	0.650 MR	0.000
					0.0	0.006 CM	1.000
					0.0	-1.000 -0.599	-0.000
					0.0	0.003 0.047	0.0 -0.001
					0.0	0.000	

0.09339 DEG

2.	0.254	-0.000	92.750 FT	92.750 FT	0.0	1.980 CM	0.999
					0.0	0.701 MR	
					0.0	1.838 CM	0.000
					0.0	0.650 MR	0.000
					0.0	0.006 CM	1.000
					0.0	-1.000 -0.599	-0.000
					0.0	0.003 0.047	0.0 -0.001
					0.0	0.000	

0.09339 DEG

4.	0.254	-0.000	92.750 FT	92.750 FT	0.0	1.980 CM	0.999
					0.0	0.701 MR	
					0.0	1.838 CM	0.000
					0.0	0.650 MR	0.000
					0.0	0.006 CM	1.000
					0.0	-1.000 -0.599	-0.000
					0.0	0.003 0.047	0.0 -0.001
					0.0	0.000	

0.18687 DEG

2.	0.330	-0.000	102.999 FT	103.000 FT	0.0	2.198 CM	0.996
					0.0	0.703 MR	
					0.0	2.041 CM	C.000
					0.0	0.650 MR	0.000
					0.0	0.013 CM	1.000
					0.0	1.000 PC	-0.000
					0.0	0.010 0.093	0.0 0.0
					0.0	0.000	-0.004

0.09339 DEG

2.	0.330	-0.000	102.999 FT	103.000 FT	0.0	2.198 CM	0.996
					0.0	0.703 MR	
					0.0	2.041 CM	C.000
					0.0	0.650 MR	0.000
					0.0	0.013 CM	1.000
					0.0	1.000 PC	-0.000
					0.0	0.010 0.093	0.0 0.0
					0.0	0.000	-0.004

-180.00000 DEG

20.	0.330	-0.000	102.999 FT	103.000 FT	0.0	2.198 CM	0.996
					0.0	0.703 MR	
					0.0	2.041 CM	C.000
					0.0	0.650 MR	0.000
					0.0	0.013 CM	1.000
					0.0	1.000 PC	-0.000
					0.0	0.010 0.093	0.0 0.0
					0.0	0.000	-0.004

1.75000 FT

3.	0.346	-0.000	104.749 FT	104.750 FT	0.0	2.236 CM	0.996
					0.0	0.703 MR	
					0.0	2.076 CM	-0.000
					0.0	0.650 MR	-0.000
					0.0	0.013 CM	1.000
					0.0	1.000 PC	-0.000
					0.0	0.011 -0.093	0.000 0.000
					0.0	0.000	-0.004

3.	0.346	-0.000	104.749 FT	104.750 FT	0.0	2.236 CM	0.996
					0.0	0.703 MR	
					0.0	2.076 CM	-0.000
					0.0	0.650 MR	-0.000
					0.0	0.013 CM	1.000
					0.0	1.000 PC	-0.000
					0.0	0.011 -0.093	0.000 0.000
					0.0	0.000	-0.004

100.000000 DEG

0.346	-0.000	104.749 FT	104.750 FT	0.0	2.236 CM	0.996	
				0.0	0.703 MR	0.000	
				0.0	2.076 CM	0.000	
				0.0	0.650 MR	0.000	1.000
				0.0	0.013 CM	-1.000	-0.000
				0.0	1.000 PC	0.011	0.0
* RRTAT*						0.093	-0.004
0.346	-0.000	104.749 FT	104.750 FT	0.0	2.236 CM	0.996	
				0.0	0.703 MR	0.000	
				0.0	2.076 CM	0.000	
				0.0	0.650 MR	0.000	
				0.0	0.013 CM	-1.000	-0.000
				0.0	1.000 PC	0.011	0.0
* REND*						0.093	-0.004
0.455	-0.000	114.999 FT	115.000 FT	0.0	2.455 CM	0.993	
				0.0	0.707 MR	0.000	
				0.0	2.279 CM	0.000	
				0.0	0.650 MR	0.000	1.000
				0.0	0.020 CM	-1.000	-0.000
				0.0	1.000 DC	0.021	0.0
* RCTAT*						0.138	-0.009
0.455	-0.000	114.999 FT	115.000 FT	0.0	2.455 CM	0.993	
				0.0	0.707 MR	0.000	
				0.0	2.279 CM	0.000	
				0.0	0.650 MR	0.000	
				0.0	0.020 CM	-1.000	-0.000
				0.0	1.000 PC	0.021	0.0
* RCTAT*						0.138	-0.009
0.455	-0.000	114.999 FT	115.000 FT	0.0	2.455 CM	0.993	
				0.0	0.707 MR	0.000	
				0.0	2.279 CM	0.000	
				0.0	0.650 MR	0.000	1.000
				0.0	0.020 CM	1.000	-0.000
				0.0	1.000 PC	-0.021	0.0
* RCTAT*						0.138	-0.009
0.612	-0.000	127.768 FT	127.770 FT	0.0	2.728 CM	0.994	
				0.0	0.707 MR	0.000	
				0.0	2.532 CM	-0.000	
				0.0	0.650 MR	-0.000	
				0.0	0.020 CM	1.000	
				0.0	1.000 PC	-0.021	
* CRAFT*						0.138	-0.009
0.735	-0.000	137.767 FT	137.770 FT	0.0	3.240 CM	1.000	
				0.0	2.714 MR	-0.000	
				0.0	2.463 CM	-0.000	
				0.0	1.002 MR	0.000	
				0.0	0.020 CM	0.999	
				0.0	1.000 PC	-0.040	
* DRIFT*						0.063	-0.009
1.753	-0.000	139.267 FT	139.270 FT	0.0	3.364 CM	0.000	

* CRAFT*

0.093339 DEG

* DRIFT*

10.25000 KG

1.50000 FT

0.00000 KG

-180.00000 DEG

-8.00000 KG

-46.25182 FT

0.753	-0.000	139.267 FT	139.270 FT	0.0	3.364 CM	1.000
				0.0	2.714 MR	-0.000
				0.0	2.413 CM	-0.000
				0.0	1.092 MR	-0.000
				0.0	0.020 CM	0.999 -1.000
				0.0	1.330 PC	-0.041 -0.063 0.000 0.000
* QUAD*		"CIA"	5.00000 FT	-2.71622 KG	3.81000 CM	(-281.19971 FT)
0.815	-0.000	144.266 FT	144.270 FT	0.0	3.808 CM	1.000
				0.0	3.130 MR	-0.000
				0.0	2.226 CM	-0.000
				0.0	1.362 MR	-0.000 -1.000
				0.0	0.020 CM	0.999 -0.000
				0.0	1.000 PC	-0.043 -0.060 0.000 0.000
* DRIFT*						
0.858	-0.000	147.766 FT	147.770 FT	0.0	4.142 CM	1.000
				0.0	3.130 MR	-0.000
				0.0	2.081 CM	-0.000
				0.0	1.362 MR	-0.000 -1.000
				0.0	0.220 CM	0.999 -0.000
				0.0	1.000 PC	-0.045 -0.060 0.000 0.000
* QUAD*						
0.980	-0.000	157.765 FT	157.770 FT	0.0	4.628 CM	0.044
				0.0	0.045 MR	-0.000
				0.0	1.877 CM	-0.000
				0.0	0.017 MR	-0.000 -0.014
				0.0	0.020 CM	0.999 -0.000
				0.0	1.000 PC	-0.048 -0.986 0.000 0.000
* DRIFT*						
0.999	-0.000	159.265 FT	159.270 FT	0.0	4.628 CM	0.045
				0.0	0.045 MR	0.000
				0.0	1.876 CM	-0.000
				0.0	0.017 MR	-0.000 -0.013
				0.0	0.020 CM	0.999 -0.000
				0.0	1.000 PC	-0.048 -0.986 0.000 0.000
* TRANSFORM 1*						
1.44897	6.60327	-0.00000	-0.00000	0.0	-0.22314	
-0.15144	-0.00000	-0.00000	0.0		-0.04420	
-0.55000	-0.00000	0.49713	2.88667	0.0	0.00000	
-0.00000	-0.00000	-0.34642	-0.00000	0.0	0.00000	
0.00578	0.07919	-0.00000	1.00000	-0.00000	1.00000	
0.0	2.0	0.0	0.0	0.0	1.00000	
* 2 Rn*						
20.					180.00000 DEG	
0.999	-0.000	159.265 FT	159.270 FT	0.0	4.628 CM	0.045
				0.0	0.045 MR	0.000
				0.0	1.876 CM	-0.000
				0.0	0.017 MR	-0.000 -0.013
				0.0	0.020 CM	0.999 -0.000
				0.0	1.000 PC	-0.048 -0.986 0.000 0.000
* RnTAT*						
2.					0.35810 DEG	
0.999	-0.000	159.265 FT	159.270 FT	0.0	4.628 CM	0.058
				0.0	0.045 MR	0.000
				0.0	1.876 CM	-0.000
				0.0	0.017 MR	-0.000 -0.027

REFND

4. "B3" 20.00000 FT 19.14998 KG 0.0 0.00000 FT 19.14998 KG 0.0 0.00000 FT 19.14998 KG 0.0

1.360 -0.000 179.261 FT 179.270 FT 0.0 4.632 CM 0.058
0.0 0.169 MR 0.000
0.0 1.876 CM 0.000
0.0 0.017 MR -0.000 -0.022
0.0 0.078 CM -1.000 -0.038 -0.000 0.000
0.0 1.000 PC 0.062 0.999 0.000 -0.000 -0.042

PCTAT

2. 0.35810 DEG 1.365 -0.000 179.261 FT 179.270 FT 0.0 4.632 CM 0.061
0.0 0.169 MR 0.000
0.0 1.876 CM 0.000
0.0 0.017 MR -0.000 -0.035
0.0 0.078 CM -1.000 -0.041 -0.000 0.000
0.0 1.000 OC. 0.062 0.999 0.000 -0.000 -0.042

Z R0

20. -180.00000 DEG 1.369 -0.000 179.261 FT 179.270 FT 0.0 4.632 CM 0.061
0.0 0.169 MR 0.000
0.0 1.876 CM 0.000
0.0 0.017 MR -0.000 -0.035
0.0 0.078 CM 1.000 0.041 -0.000 0.000
0.0 1.000 PC -0.062 -0.999 0.000 0.000 -0.042

DRAFT

3. 1.50000 FT 1.407 -0.000 180.761 FT 180.770 FT 0.0 4.632 CM 0.063
0.0 0.169 MR 0.000
0.0 1.876 CM 0.000
0.0 0.017 MR -0.000 -0.035
0.0 0.078 CM 1.000 0.041 -0.000 0.000
0.0 1.000 PC -0.064 -0.999 0.000 0.000 -0.042

Z R0

20. 180.00000 DEG 1.407 -0.000 180.761 FT 180.770 FT 0.0 4.632 CM 0.063
0.0 0.169 MR 0.000
0.0 1.876 CM 0.000
0.0 0.017 MR -0.000 -0.035
0.0 0.078 CM -1.000 -0.041 -0.000 0.000
0.0 1.000 PC 0.064 0.999 0.000 -0.000 -0.042

PCTAT

2. 0.35910 DEG 1.407 -0.000 180.761 FT 180.770 FT 0.0 4.632 CM 0.067
0.0 0.169 MR 0.000
0.0 1.876 CM 0.000
0.0 0.017 MR -0.000 -0.049
0.0 0.078 CM -1.000 -0.045 -0.000 0.000
0.0 1.000 PC 0.064 0.999 0.000 -0.000 -0.042

REFND

4. "B3A" 20.00000 FT 19.14998 KG 0.0 0.00000 FT 19.14998 KG 0.0 0.00000 FT 19.14998 KG 0.0 0.00000 FT 19.14998 KG 0.0

2.027 -0.000 200.751 FT 200.770 FT 0.0 4.643 CM 0.092
0.0 0.294 MR 0.000
0.0 1.876 CM 0.000
0.0 0.017 MR -0.000 -0.043
0.0 0.136 CM -0.999 -0.055 -0.000 0.000
0.0 1.000 PC 0.094 1.000 0.000 -0.000 -0.057

PCTAT

2. 0.35810 DEG

2.027 -0.000 200.751 FT 200.770 FT
 0.0 4.643 CM 0.094
 0.0 0.294 MR 0.000
 0.0 1.876 CM 0.000
 0.0 0.017 MR -0.000 -0.000 -0.357
 0.0 0.136 CM -0.999 -0.057 -0.000 0.000
 0.0 1.000 PC 0.094 1.000 0.000 -0.000 -0.057

7 R7 20. -180.00000 DEG

2.027 -0.000 200.751 FT 200.770 FT
 0.0 4.643 CM 0.094
 0.0 0.294 MR 0.000
 0.0 1.876 CM -0.000 -0.000
 0.0 0.017 MR -0.000 -0.000 -0.057
 0.0 0.136 CM 0.999 0.057 -0.000 -0.000
 0.0 1.000 PC -0.094 -1.000 0.000 0.000 -0.057

DRAFT 3. 1.50000 FT

2.083 -0.000 202.250 FT 202.270 FT
 0.0 4.645 CM 0.097
 0.0 0.294 MR 0.000
 0.0 1.876 CM -0.000 -0.000
 0.0 0.017 MR -0.000 -0.000 -0.057
 0.0 0.136 CM 0.999 0.057 -0.000 -0.000
 0.0 1.000 PC -0.097 -1.000 0.000 0.000 -0.057

Z ROT 20. 180.00000 DEG

2.083 -0.000 202.250 FT 202.270 FT
 0.0 4.645 CM 0.097
 0.0 0.294 MR 0.000
 0.0 1.876 CM 0.000 0.000
 0.0 0.017 MR -0.000 -0.000 -0.057
 0.0 0.136 CM 0.999 0.057 -0.000 0.000
 0.0 1.000 PC -0.097 1.000 0.000 -0.000 -0.057

ROTAT 2. 0.35810 DEG

2.083 -0.000 202.250 FT 202.270 FT
 0.0 4.645 CM 0.099
 0.0 0.294 MR 0.000
 0.0 1.876 CM 0.000 0.000
 0.0 0.017 MR -0.000 -0.000 -0.070
 0.0 0.136 CM 0.999 -0.059 -0.000 0.000
 0.0 1.000 PC 0.097 1.000 0.000 -0.000 -0.057

ROTAT 4. "R4" 20.00000 FT 19.14998 KG 0.0 0.71614 DEG 1

2.053 -0.000 222.231 FT 222.270 FT
 0.0 4.671 CM 0.141
 0.0 0.419 MR 0.000
 0.0 1.875 CM -0.000 -0.000
 0.0 0.017 MR -0.000 -0.000 -0.065
 0.0 0.194 CM -0.998 -0.074 -0.000 0.000
 0.0 1.000 PC 0.143 1.000 -0.000 -0.000 -0.076

ROTAT 2. 0.35810 DFG

2.053 -0.000 222.231 FT 222.270 FT
 0.0 4.671 CM 0.143
 0.0 0.419 MR 0.000
 0.0 1.875 CM -0.000 -0.000
 0.0 0.017 MR -0.000 -0.000 -0.079
 0.0 0.194 CM -0.998 -0.075 -0.003 0.000
 0.0 1.000 PC 0.143 1.000 -0.000 -0.000 -0.076

Z R7 20. -180.00000 DEG

2.053 -0.000 222.231 FT 222.270 FT
 0.0 4.671 CM 0.143
 0.0 0.419 MR 0.000
 0.0 1.875 CM -0.000 -0.000
 0.0 0.017 MR -0.000 -0.000 -0.079
 0.0 0.194 CM -0.998 -0.075 -0.003 0.000
 0.0 1.000 PC 0.143 1.000 -0.000 -0.000 -0.076

0.0	0.419 MR	0.143
0.0	1.875 CM	-0.000 -0.000
0.0	0.017 MR	-0.000 -0.000 -0.079
0.0	0.194 CM	0.998 0.075 -0.000 -0.000
0.0	1.000 PC	-0.143 -1.000 0.000 0.000 -0.076

DRIFT 3. 1.50000 FT

3.028	-0.000	223.729 FT	223.770 FT	0.0	4.673 CM	
				0.0	0.419 MR	0.147
				0.0	1.875 CM	-0.000 -0.000
				0.0	0.017 MR	-0.000 -0.000 -0.078
				0.0	0.194 CM	0.997 0.075 -0.000 -0.000
				0.0	1.000 PC	-0.147 -1.000 0.000 0.000 -0.076

Z RO 20. 180.00000 DEG

3.028	-0.000	223.729 FT	223.770 FT	0.0	4.673 CM	
				0.0	0.419 MR	0.147
				0.0	1.875 CM	0.000 -0.000
				0.0	0.017 MR	-0.000 -0.000 -0.078
				0.0	0.194 CM	-0.997 -0.075 -0.000 0.000
				0.0	1.000 PC	0.147 1.000 -0.000 -0.000 -0.076

PCTAT 2. 0.35810 DEG

3.028	-0.000	223.729 FT	223.770 FT	0.0	4.673 CM	
				0.0	0.419 MR	0.148
				0.0	1.875 CM	0.000 -0.000
				0.0	0.017 MR	-0.000 -0.000 -0.092
				0.0	0.194 CM	-0.997 -0.077 -0.000 0.000
				0.0	1.000 PC	0.147 1.000 -0.000 -0.000 -0.076

REND 4. "B5" 20.00000 FT 19.14998 KG 0.0 0.71614 DEG)

4.148	-0.000	243.697 FT	243.770 FT	0.0	4.725 CM	
				0.0	0.544 MR	0.206
				0.0	1.874 CM	0.000 -0.000
				0.0	0.017 MR	-0.000 -0.000 -0.086
				0.0	0.253 CM	-0.994 -0.098 -0.000 0.000
				0.0	1.000 PC	0.208 1.000 -0.000 -0.000 -0.099

POTAT 2. 0.35810 DEG

4.148	-0.000	243.697 FT	243.770 FT	0.0	4.725 CM	
				0.0	0.544 MR	0.207
				0.0	1.874 CM	0.000 -0.000
				0.0	0.017 MR	-0.000 -0.000 -0.100
				0.0	0.253 CM	-0.994 -0.099 -0.000 0.000
				0.0	1.000 PC	0.208 1.000 -0.000 -0.000 -0.099

Z RO 20. -180.00000 DEG

4.148	-0.000	243.697 FT	243.770 FT	0.0	4.725 CM	
				0.0	0.544 MR	0.207
				0.0	1.874 CM	-0.000 -0.000
				0.0	0.017 MR	-0.000 -0.000 -0.100
				0.0	0.253 CM	0.994 0.099 -0.000 -0.000
				0.0	1.000 PC	-0.208 -1.000 0.000 0.000 -0.099

DRTET 3. 1.50000 FT

4.241	-0.000	245.194 FT	245.269 FT	0.0	4.731 CM	
				0.0	0.544 MR	0.212
				0.0	1.874 CM	-0.000 -0.000
				0.0	0.017 MR	-0.000 -0.000 -0.099

CLAN

5.	"C3"	"	10.00000 FT	7.73573 KG	0.0	3.81000 CM	(51.22119 FT)	
4. E64	-0.000	255.175 FT	255.269 FT	0.0	4.298 CM	-0.980	-0.213 -1.000	0.000 0.000 -0.099
				0.0	2.965 MR	-0.000	-0.000	-0.000
				0.0	2.066 CM	-0.000	0.000	1.000
				0.0	1.282 MR	-0.000	0.000	-0.000
				0.0	0.253 CM	0.989	-0.999	-0.000 -0.000
				0.0	1.000 PC	-0.248	0.052	0.000 0.000 -0.099

PROFT

3.			1.50000 FT		0.0	4.165 CM	-0.979	-0.000
4. E957	-0.000	256.672 FT	256.769 FT	0.0	2.965 MR	-0.000	-0.000	-0.000
				0.0	2.124 CM	-0.000	0.000	1.000
				0.0	1.282 MR	-0.000	0.000	-0.000
				0.0	0.253 CM	0.988	-0.999	-0.000 -0.000
				0.0	1.000 PC	-0.254	0.052	0.000 0.000 -0.099

CUAN

5.	"C4"	"	10.00000 FT	-8.03880 KG	0.0	3.81000 CM	-46.02092 FT)	
5. E579	-0.000	266.652 FT	266.769 FT	0.0	3.699 CM	-0.293	-0.000	-0.000
				0.0	0.711 MR	-0.000	-0.000	-0.000
				0.0	2.293 CM	-0.000	0.000	-0.999
				0.0	0.263 MR	-0.000	-0.000	0.038
				0.0	0.253 CM	0.978	-0.486	-0.000 0.000
				0.0	1.000 PC	-0.304	-0.822	0.000 0.000 -0.099

CFIFT

3.			285.23975 FT		0.0	6.207 CM	0.822	-0.000
23. E333	-0.000	551.339 FT	552.009 FT	0.0	0.711 MR	-0.000	-0.000	-0.000
				0.0	0.124 CM	-0.000	0.000	-0.000
				0.0	0.263 MR	-0.000	-0.000	0.000
				0.0	0.253 CM	0.009	-0.486	-0.000 0.000
				0.0	1.000 PC	-1.000	-0.822	0.000 0.000 -0.099

TRANSFOPM 1

-1.72706	0.00008	-0.00000	-0.00000	0.0	-6.20596			
-0.27947	-0.57900	-0.00000	-0.00000	0.0	-0.58457			
-0.00000	-0.00000	-2.47610	0.00006	0.0	0.00000			
-0.00000	-0.00000	-0.20116	-0.40385	C.0	0.00000			
0.07748	0.35933	-0.00000	-0.00000	1.00000	-0.02506			
0.0	0.0	0.0	0.0	0.0	1.00000			

CUAN

5.	"C5FL"	"	5.00000 FT	5.22757 KG	0.0	3.81000 CM	147.37895 FT)	
23. E44	-0.000	556.329 FT	557.009 FT	0.0	6.190 CM	-0.892	-0.000	-0.000
				0.0	0.900 MR	-0.000	0.000	-0.000
				0.0	0.134 CM	-0.000	0.000	0.432
				0.0	0.270 MR	-0.000	0.000	-0.000
				0.0	0.253 CM	0.089	-0.529	-0.000 0.000
				0.0	1.000 PC	-1.000	0.897	0.000 0.000 -0.099

PROFT

3.			207.26999 FT		0.0	2.800 CM	0.058	-0.000
36. E544	-0.000	763.197 FT	764.279 FT	0.0	0.900 MR	-0.000	0.000	-0.000
				0.0	1.766 CM	-0.000	0.000	-0.000
				0.0	0.270 MR	-0.000	0.000	0.998
				0.0	0.253 CM	-0.878	-0.529	-0.000 -0.000
				0.0	1.000 PC	-0.390	0.897	0.000 0.000 -0.099

CLAN

5.	"C6"	"	10.00000 FT	-6.63053 KG	0.0	3.81000 CM	(-56.13400 FT)
----	------	---	-------------	-------------	-----	------------	------------------

DRAFT

27.167	-0.000	773.178 FT	774.279 FT
0.0	3.076 CM		
	1.955 MR		
0.0	-0.000 0.000		
0.0	1.695 CM		
0.0	-0.000 -1.000		
0.0	0.728 MR		
0.0	0.000 -0.000		
0.0	0.253 CM		
0.0	-0.918 -1.000 -0.000 0.000		
0.0	1.000 PC		
	-0.304 0.123 0.303 -0.000 -0.099		

10.30000 FT

3.

37.808	-0.000	783.458 FT	784.579 FT
0.0	3.642 CM		
	1.955 MR		
0.0	-0.000 0.000		
0.0	1.466 CM		
0.0	-0.000 -1.000		
0.0	0.728 MR		
0.0	0.000 -0.000		
0.0	0.253 CM		
0.0	-0.944 -1.000 -0.000 0.000		
0.0	1.000 PC		
	-0.236 0.123 0.000 -0.000 -0.099		

OLANT

5.	"C7 "	10.00000 FT	6.06000 KG
			3.81000 CM
38.430	-0.000	793.438 FT	794.579 FT
0.0	3.906 CM		
	0.655 MR		
0.0	-0.185		
0.0	1.356 CM		
0.0	-0.700 0.000		
0.0	0.024 MP		
0.0	-0.000 -0.196		
0.0	0.253 CM		
0.0	-0.960 -0.099 -0.000 0.000		
0.0	1.000 PC		
	-0.184 1.000 0.000 -0.000 -0.099		

TRANSFORM 1

0.18235	-0.00000	-5.48372	0.00000	-0.00000	0.0	-0.72050
-0.00000	-0.00000	0.00000	0.30000	0.0	0.65526	
0.00000	-0.00000	-5.32506	-2.04557	0.0	0.00001	
0.07248	0.00000	0.48837	0.00000	0.0	-0.00000	
0.35933	-0.00000	-0.00000	-0.00000	1.00000	-0.02506	
0.0	0.0	0.0	0.0	0.0	1.00000	

CRIFT

3.		1.50000 FT	
38.574	-0.000	794.935 FT	796.079 FT
0.0	3.901 CM		
	0.655 MR		
0.0	-0.177		
0.0	1.356 CM		
0.0	-0.000 0.000		
0.0	0.024 MR		
0.0	-0.000 -0.196		
0.0	0.253 CM		
0.0	-0.962 -0.099 -0.000 0.000		
0.0	1.000 PC		
	-0.177 1.000 0.000 -0.000 -0.099		

SEXT

18.	"X5 "	2.50000 FT	0.0	KG	5.00000 CM
38.670	-0.000	797.430 FT	798.578 FT		
0.0	3.892 CM				
	0.655 MR				
0.0	-0.165				
0.0	1.355 CM				
0.0	-0.000 0.000				
0.0	0.024 MR				
0.0	-0.000 -0.194				
0.0	0.253 CM				
0.0	-0.965 -0.099 -0.000 0.000				
0.0	1.000 PC				
	-0.165 1.000 0.000 -0.000 -0.099				

SELT

3.		6.50000 FT	
39.084	-0.000	803.918 FT	805.078 FT
0.0	3.873 CM		
	0.655 MR		
0.0	-0.132		
0.0	1.354 CM		
0.0	-0.000 0.000		
0.0	0.024 MP		
0.0	-0.000 -0.191		
0.0	0.253 CM		
0.0	-0.973 -0.099 -0.000 0.000		
0.0	1.000 PC		
	-0.132 1.000 0.000 -0.000 -0.099		

Z RLT

20.		180.00000 DEG	
39.084	-0.000	803.918 FT	805.078 FT
0.0	3.873 CM		
	0.655 MP		
0.0	-0.132		
0.0	1.354 CM		
	-0.000 0.000		

PCTAT		0.34922 DEG			
39. CP4	-0.000	803.918 FT	805.078 FT	0.0	3.873 CM
				0.0	0.655 MR
				0.0	1.354 CM
				0.0	0.924 MR
				0.0	0.253 CM
				0.0	1.000 PC
RFN4					0.000 -0.000 -0.000 -0.000 -0.000 -0.000
4.	"R6	"	20.00000 FT	18.68999 KG	0.0
					0.69894 DEG 1
40.450	-0.000	823.871 FT	825.078 FT	0.0	3.842 CM
				0.0	0.533 MR
				0.0	1.352 CM
				0.0	0.024 MR
				0.0	0.207 CM
				0.0	1.000 PC
PCTAT					0.039 -1.000 -0.000 0.000 -0.000 -0.140
2.				0.34922 DEG	
40.450	-0.000	823.871 FT	825.078 FT	0.0	3.842 CM
				0.0	0.533 MR
				0.0	1.352 CM
				0.0	0.025 MR
				0.0	0.207 CM
				0.0	1.000 PC
7 R7				-180.00000 DEG	
40.450	-0.000	823.871 FT	825.078 FT	0.0	3.842 CM
				0.0	0.533 MR
				0.0	1.352 CM
				0.0	0.025 MR
				0.0	0.207 CM
				0.0	1.000 PC
CRIFT				1.50000 FT	
40.562	-0.000	825.366 FT	826.578 FT	0.0	3.841 CM
				0.0	0.533 MR
				0.0	1.351 CM
				0.0	0.025 MR
				0.0	0.207 CM
				0.0	1.000 PC
7 R7				180.00000 DEG	
40.562	-0.000	825.366 FT	826.578 FT	0.0	3.841 CM
				0.0	0.533 MR
				0.0	1.351 CM
				0.0	0.025 MR
				0.0	0.207 CM
				0.0	1.000 PC
PCTAT				0.13980 DEG	
40.562	-0.000	825.366 FT	826.578 FT	0.0	3.841 CM
				0.0	0.533 MR
				0.0	1.351 CM
				0.0	0.025 MR
				0.0	0.207 CM
				0.0	1.000 PC
PCTAT				0.000 -0.000 -0.000 -0.000 -0.000 -0.140	

REND

4. "B6A" 8.00000 FT 18.68999 KG 0.0

41.177 -0.000 833.343 FT 834.578 FT 0.0 3.839 CM
 0.0 0.485 MR -0.001
 0.0 1.350 CM 0.000
 0.0 0.025 MR -0.000 -0.000 -0.191
 0.0 0.183 CM 0.155 0.000 -0.000
 0.0 1.000 PC 0.000 -1.000 -0.000 0.000 -0.156

PCATATE

2. "B6A" 8.00000 FT 18.68999 KG 0.0 0.27958 DEG)
 41.177 -0.000 833.343 FT 834.578 FT 0.0 3.839 CM
 0.0 0.485 MR -0.000
 0.0 1.350 CM 0.000
 0.0 0.025 MR -0.000 -0.193
 0.0 0.183 CM 0.155 0.000 -0.000
 0.0 1.000 PC 0.000 -1.000 -0.000 0.000 -0.156

Z R7

20. "B6A" 8.00000 FT 18.68999 KG 0.0 0.27958 DEG)
 41.177 -0.000 833.343 FT 834.578 FT 0.0 3.839 CM
 0.0 0.485 MR -0.000
 0.0 1.350 CM 0.000
 0.0 0.025 MR -0.000 -0.193
 0.0 0.183 CM 0.155 -0.003 0.000
 0.0 1.000 PC -0.000 1.000 0.000 -0.000 -0.156

TRANSENDRM 1

-1.08426 -5.48372 0.00000 0.00000 0.0 -0.00008
 0.18235 -0.00000 0.00000 0.00000 0.0 0.48448
 -0.000000 -C. CC000 -4.72823 -2.04524 0.0 0.00001
 0.000000 0.00000 0.49056 0.01170 0.0 -0.00000
 0.05253 0.26568 0.00000 -0.00000 1.00000 -0.02931
 0.0 0.0 0.0 0.0 0.0 1.00000

*DRAFT#

3. "B6A" 8.00000 FT 1.50000 FT 0.0 0.27958 DEG)
 41.296 -0.000 834.838 FT 836.078 FT 0.0 3.839 CM
 0.0 0.485 MR 0.005
 0.0 1.350 CM 0.000
 0.0 0.025 MR -0.000 -0.193
 0.0 0.183 CM 0.155 -0.000 0.000
 0.0 1.000 PC 0.006 1.000 0.000 -0.000 -0.156

SEXT

19. "X6" 2.50000 FT 0.0 KG 5.00000 CM
 41.494 -0.000 837.330 FT 838.578 FT 0.0 3.839 CM
 0.0 0.485 MR 0.015
 0.0 1.350 CM 0.000
 0.0 0.025 MR -0.000 -0.191
 0.0 0.183 CM 0.155 -0.000 0.000
 0.0 1.000 PC 0.015 1.000 0.000 -0.000 -0.156

*DRAFT#

3. "B6A" 8.00000 FT 1.50000 FT 0.0 0.27958 DEG)
 41.613 -0.000 838.825 FT 840.078 FT 0.0 3.840 CM
 0.0 0.485 MR 0.021
 0.0 1.349 CM 0.000
 0.0 0.025 MR -0.000 -0.190
 0.0 0.188 CM -0.991 -0.155 -0.003 0.000
 0.0 1.000 PC 0.021 1.000 0.000 -0.000 -0.156

GUAR

47.405 -0.000 848.794 FT 850.078 FT 0.0 3.537 CM
 2.035 MR 2.035 MR

QUAD	43.249	-0.000	860.656 FT	11.90000 FT	861.978 FT	0.0	2.831 CM	0.000	0.000
						0.0	2.035 MR	-0.946	
						0.0	1.726 CM	0.003	0.000
						0.0	0.736 MR	0.000	1.000
						0.0	0.188 CM	-0.996	-0.000
						0.0	1.000 PC	0.062	0.000
						0.0	0.198	0.000	-0.156
DRIFT	44.142	-0.000	870.625 FT	10.00000 FT	871.978 FT	0.0	2.483 CM	-0.454	
						0.0	0.841 MR	0.572	
						0.0	1.797 CM	0.000	0.000
						0.0	0.279 MR	-0.000	-0.998
						0.0	0.183 CM	-0.998	0.000
						0.0	1.000 PC	0.211	0.000
						0.0	0.775	-0.000	-0.156
DRIFT	52.409	-0.000	974.586 FT	104.28999 FT	976.268 FT	0.0	2.698 CM	-56.20372 FT)
						0.0	0.841 MR		
						0.0	0.614 CM	0.000	
						0.0	0.279 MR	-0.000	-0.992
						0.0	0.188 CM	-0.420	0.000
						0.0	1.000 PC	0.962	0.000
						0.0	0.775	-0.000	-0.156
QUAD	53.222	-0.000	984.555 FT	10.00000 FT	986.268 FT	0.0	2.961 CM	-126.47684 FT)
						0.0	1.393 MR	0.893	
						0.0	0.795 CM	0.000	
						0.0	0.495 MR	-0.000	-0.997
						0.0	0.188 CM	-0.354	0.000
						0.0	1.000 PC	0.979	0.000
						0.0	0.966	-0.000	-0.156
DRIFT	56.459	-0.000	1025.505 FT	41.07999 FT	1027.348 FT	0.0	4.592 CM	0.957	
						0.0	1.398 MR	-0.000	
						0.0	0.181 CM	-0.000	0.000
						0.0	0.498 MR	-0.000	-0.933
						0.0	0.188 CM	-0.188	0.000
						0.0	1.000 PC	0.999	0.000
						0.0	0.966	-0.000	-0.156
QUAD	57.251	-0.000	1035.474 FT	5.97291 KG	1037.348 FT	0.0	4.637 CM	-0.933	
						0.0	1.118 MR		
						0.0	0.075 CM	-0.000	0.000
						0.0	0.451 MR	-0.000	-0.282
						0.0	0.188 CM	-0.163	0.000
						0.0	1.000 PC	1.000	0.000
						0.0	0.966	-0.000	-0.156
DRIFT	57.476	-0.000	1038.295 FT	2.83000 FT	1040.178 FT	0.0	4.547 CM	-0.931	
						0.0	1.118 MR		
						0.0	0.074 CM	-0.000	0.000
						0.0	0.450 MR	-0.000	0.237

TRANSFORM 1

1.71135	0.00023	0.00000	0.00000	0.0	4.54655	0.0	0.450 MR	-0.000	0.000	0.237	
-0.27615	0.58428	-0.00000	-0.00000	0.0	-1.04059	0.0	0.188 CM	-0.155	0.506	0.000	0.000
0.00000	0.00000	1.48697	-0.00031	0.0	-0.00000	0.0	1.000 PC	1.000	-0.931	-0.000	-0.000
0.01000	0.00000	2.15651	0.67205	0.0	-0.00000	0.0					-0.156
0.05253	0.26568	0.00000	-0.00000	1.00000	-0.02931	0.0					
0.0	0.0	0.0	0.0	0.0	1.00000	0.0					

DRIFT

3. 82.89999 FT

64.048	-0.000	1120.934 FT	1123.078 FT	0.0	2.179 CM	0.0					
				0.0	1.118 MR	0.0	-0.646				
				0.0	1.157 CM	0.0	-0.000	0.000			
				0.0	0.450 MR	0.0	-0.000	0.000	0.998		
				0.0	0.188 CM	0.0	0.332	0.506	0.000	0.000	
				0.0	1.000 PC	0.0	0.880	-0.931	-0.000	-0.000	-0.156

QUAD

5. "Q12" 10.00000 FT -7.50000 KG

3.81000 CM (-49.44127 FT)

64.840	-0.000	1130.902 FT	1133.078 FT	0.0	2.185 CM	0.0					
				0.0	1.143 MR	0.0	0.667				
				0.0	1.178 CM	0.0	-0.000	-0.000			
				0.0	0.314 MR	0.0	0.000	0.000	-0.996		
				0.0	0.188 CM	0.0	0.445	0.964	0.000	-0.000	
				0.0	1.000 PC	0.0	0.815	0.112	-0.000	0.000	-0.156

DRIFT

3. 2.00000 FT

64.999	-0.000	1132.896 FT	1135.077 FT	0.0	2.232 CM	0.0					
				0.0	1.143 MR	0.0	0.684				
				0.0	1.159 CM	0.0	-0.000	-0.000			
				0.0	0.314 MR	0.0	0.000	0.000	-0.996		
				0.0	0.188 CM	0.0	0.466	0.964	0.000	-0.000	
				0.0	1.000 PC	0.0	0.801	0.112	-0.000	0.000	-0.156

QUAD

5. "Q11" 5.00000 FT -8.31518 KG

3.81000 CM (-91.29976 FT)

65.395	-0.000	1137.880 FT	1140.077 FT	0.0	2.416 CM	0.0					
				0.0	1.819 MR	0.0	0.906				
				0.0	1.080 CM	0.0	-0.000	-0.000			
				0.0	0.714 MR	0.0	0.000	0.000	-0.999		
				0.0	0.188 CM	0.0	0.512	0.828	0.000	-0.000	
				0.0	1.000 PC	0.0	0.768	0.425	-0.000	0.000	-0.156

DRIFT

3. 2.29000 FT

65.577	-0.000	1140.163 FT	1142.367 FT	0.0	2.532 CM	0.0					
				0.0	1.819 MR	0.0	0.915				
				0.0	1.030 CM	0.0	-0.000	-0.000			
				0.0	0.714 MR	0.0	0.000	0.000	-0.999		
				0.0	0.188 CM	0.0	0.531	0.828	0.000	-0.000	
				0.0	1.000 PC	0.0	0.755	0.425	-0.000	0.000	-0.156

QUAD

5. "Q13A" 5.00000 FT 3.79776 KG

3.81000 CM (202.54938 FT)

65.973	-0.000	1145.147 FT	1147.367 FT	0.0	2.756 CM	0.0					
				0.0	1.431 MR	0.0	0.882				
				0.0	0.934 CM	0.0	-0.000	-0.000			
				0.0	0.555 MR	0.0	0.000	0.000	-0.998		
				0.0	0.188 CM	0.0	0.564	0.887	0.000	-0.000	
				0.0	1.000 PC	0.0	0.727	0.318	-0.000	0.000	-0.156

66.132 -0.000 1147.141 FT 1149.367 FT 0.0 2.833 CM
 0.0 1.431 MR 0.889
 0.0 0.900 CM -0.000 -0.000
 0.0 0.555 MR 0.000 0.000 -0.998
 0.0 0.188 CM 0.576 0.887 0.000 -0.000
 0.0 1.000 PC 0.717 0.318 -0.000 0.000 -0.156

* QUAD* 5. "C13" 10.00000 FT 7.50000 KG 3.81000 CM (52.77618 FT)

66.924 -0.000 1157.109 FT 1159.367 FT 0.0 2.941 CM
 0.0 0.852 MR -0.670
 0.0 0.816 CM -0.000 0.000
 0.0 0.741 MR 0.000 -0.000 -0.262
 0.0 0.188 CM 0.629 0.155 0.000 -0.000
 0.0 1.000 PC 0.670 -1.000 -0.000 0.000 -0.156

* PRIFT* 3. 1.50000 FT

67.043 -0.000 1158.604 FT 1160.867 FT 0.0 2.915 CM
 0.0 0.852 MR -0.663
 0.0 0.815 CM -0.000 0.000
 0.0 0.041 MR 0.000 -0.000 -0.260
 0.0 0.188 CM 0.637 0.155 0.000 -0.000
 0.0 1.000 PC 0.663 -1.000 -0.000 0.000 -0.156

* TRANSFORM 1 *

1.34358	3.11797	0.00000	0.00000	0.0	1.93176
-0.32073	-0.00004	-0.00000	-0.00000	0.0	-0.85209
0.00000	0.00000	4.29079	1.20981	0.0	-0.00000
-0.00000	-0.00000	-0.82599	0.00019	0.0	0.00000
0.05253	0.26568	0.00000	-0.00000	1.00000	-0.02931
0.0	0.0	0.0	0.0	0.0	1.00000

* PCTATE*

2. 0.34922 DEG

67.043 -0.000 1158.604 FT 1160.867 FT 0.0 2.915 CM
 0.0 0.852 MR -0.663
 0.0 0.815 CM -0.000 0.000
 0.0 0.041 MR 0.000 -0.000 -0.263
 0.0 0.188 CM 0.637 0.156 0.000 -0.000
 0.0 1.000 PC 0.663 -1.000 -0.000 0.000 -0.156

* BEND*

4. "B7" 20.00000 FT 18.67998 KG 0.0 (0.69856 DEG)

68.507 -0.000 1178.551 FT 1180.867 FT 0.0 2.621 CM
 0.0 0.731 MR -0.554
 0.0 0.809 CM -0.000 0.000
 0.0 0.041 MR 0.000 -0.000 -0.233
 0.0 0.167 CM 0.630 0.298 0.000 -0.000
 0.0 1.000 PC 0.553 -1.000 -0.000 0.000 -0.299

* PCTATE*

2. 0.34922 DEG

68.507 -0.000 1178.551 FT 1180.867 FT 0.0 2.621 CM
 0.0 0.730 MR -0.553
 0.0 0.809 CM -0.000 0.000
 0.0 0.041 MR 0.000 -0.000 -0.236
 0.0 0.167 CM 0.630 0.298 0.000 -0.000
 0.0 1.000 PC 0.553 -1.000 -0.000 0.000 -0.299

* PRIFT*

3. 1.50000 FT

68.408 -0.000 1180.047 FT 1182.367 FT 0.0 2.602 CM
 0.0 0.730 MR -0.545
 0.0 0.809 CM -0.000 0.000

PCTAT

2.

68.608

-0.000

1180.047 FT

1182.367 FT

*PEN**
4. "PB" 20.0000 FT 18.67998 KG
69.829 -0.000 1200.010 FT 1202.367 FT

PCTAT
2.
69.829 -0.000 1200.010 FT 1202.367 FT

0.34922 DEG

*PEN**
4. "PB" 20.0000 FT 18.67998 KG
69.911 -0.000 1201.507 FT 1203.867 FT

PCTAT
2.
69.911 -0.000 1201.507 FT 1203.867 FT

0.34922 DEG

*PEN**
4. "PB" 20.0000 FT 18.67998 KG
70.893 -0.000 1221.483 FT 1223.867 FT

PCTAT
2.
70.893 -0.000 1221.483 FT 1223.867 FT

0.34922 DEG

*PEN**
4. "PB" 20.0000 FT 18.67998 KG
69.911 -0.000 1201.507 FT 1203.867 FT

PCTAT
2.
69.911 -0.000 1201.507 FT 1203.867 FT

0.34922 DEG

*PEN**
4. "PB" 20.0000 FT 18.67998 KG
70.893 -0.000 1221.483 FT 1223.867 FT

PCTAT
2.
70.893 -0.000 1221.483 FT 1223.867 FT

0.34922 DEG

*PEN**
4. "PB" 20.0000 FT 18.67998 KG
69.911 -0.000 1201.507 FT 1203.867 FT

PCTAT
2.
69.911 -0.000 1201.507 FT 1203.867 FT

0.34922 DEG

*PEN**
4. "PB" 20.0000 FT 18.67998 KG
70.893 -0.000 1221.483 FT 1223.867 FT

PCTAT
2.
70.893 -0.000 1221.483 FT 1223.867 FT

*PEN**
4. "PB" 20.0000 FT 18.67998 KG
69.911 -0.000 1201.507 FT 1203.867 FT

PCTAT
2.
69.911 -0.000 1201.507 FT 1203.867 FT

0.34922 DEG

0.0 2.602 CM
0.0 -0.730 MR
0.0 0.808 CM
0.0 0.041 MR
0.0 0.167 CM
0.0 1.000 PC

-0.544
-0.000 0.000
0.000 -0.000 -0.233
0.638 0.298 0.000 -0.000
0.544 -1.000 -0.000 0.000 -0.299

-0.544
-0.000 0.000
0.000 -0.000 -0.236
0.638 0.299 0.000 -0.000
0.544 -1.000 -0.000 0.000 -0.299

-0.544
-0.000 0.000
0.000 -0.000 -0.236
0.638 0.299 0.000 -0.000
0.544 -1.000 -0.000 0.000 -0.299

0.0 0.0 0.0 0.0 0.0

(0.69856 DEG)

0.0 2.405 CM
0.0 -0.609 MR
0.0 0.803 CM
0.0 0.041 MR
0.0 0.148 CM
0.0 1.000 PC

-0.420
-0.000 0.000
0.000 -0.000 -0.206
0.633 0.437 0.000 -0.000
0.419 -1.000 -0.000 0.000 -0.437

0.0 2.405 CM
0.0 -0.608 MR
0.0 0.803 CM
0.0 0.041 MR
0.0 0.148 CM
0.0 1.000 PC

-0.420
-0.000 0.000
0.000 -0.000 -0.208
0.633 0.437 0.000 -0.000
0.419 -1.000 -0.000 0.000 -0.437

0.0 2.393 CM
0.0 0.608 MR
0.0 0.802 CM
0.0 0.041 MR
0.0 0.148 CM
0.0 1.000 PC

-0.410
-0.000 0.000
0.000 -0.000 -0.206
0.641 0.437 0.000 -0.000
0.410 -1.000 -0.000 0.000 -0.437

0.0 2.393 CM
0.0 0.608 MR
0.0 0.802 CM
0.0 0.041 MR
0.0 0.148 CM
0.0 1.000 PC

-0.410
-0.000 0.000
0.000 -0.000 -0.208
0.641 0.437 0.000 -0.000
0.410 -1.000 -0.000 0.000 -0.437

0.0 2.393 CM
0.0 0.608 MR
0.0 0.802 CM
0.0 0.041 MR
0.0 0.148 CM
0.0 1.000 PC

-0.410
-0.000 0.000
0.000 -0.000 -0.206
0.641 0.437 0.000 -0.000
0.410 -1.000 -0.000 0.000 -0.437

0.0 2.393 CM
0.0 0.608 MR
0.0 0.802 CM
0.0 0.041 MR
0.0 0.148 CM
0.0 1.000 PC

-0.410
-0.000 0.000
0.000 -0.000 -0.208
0.641 0.437 0.000 -0.000
0.410 -1.000 -0.000 0.000 -0.437

0.0 2.393 CM
0.0 0.608 MR
0.0 0.802 CM
0.0 0.041 MR
0.0 0.148 CM
0.0 1.000 PC

-0.410
-0.000 0.000
0.000 -0.000 -0.206
0.641 0.437 0.000 -0.000
0.410 -1.000 -0.000 0.000 -0.437

0.0 2.393 CM
0.0 0.608 MR
0.0 0.802 CM
0.0 0.041 MR
0.0 0.148 CM
0.0 1.000 PC

-0.410
-0.000 0.000
0.000 -0.000 -0.208
0.641 0.437 0.000 -0.000
0.410 -1.000 -0.000 0.000 -0.437

0.0 2.393 CM
0.0 0.608 MR
0.0 0.802 CM
0.0 0.041 MR
0.0 0.148 CM
0.0 1.000 PC

-0.410
-0.000 0.000
0.000 -0.000 -0.206
0.641 0.437 0.000 -0.000
0.410 -1.000 -0.000 0.000 -0.437

1.000 PC

U.O.UU U.M
0.0 0.041 MR
0.0 0.167 CM
0.0 1.000 PC

0.000 0.000 -0.233
0.638 0.298 0.000 -0.000
0.544 -1.000 -0.000 0.000 -0.299

-L.UGU U.OUU
0.0 0.041 MR
0.0 0.167 CM
0.0 1.000 PC

0.000 0.000 -0.233
0.638 0.298 0.000 -0.000
0.544 -1.000 -0.000 0.000 -0.299

DRIFT

3. 1.50000 FT

2. 1.50000 FT

70.953 -0.000 1222.982 FT 1225.367 FT
 0.0 2.270 CM
 0.0 0.487 MR
 0.0 0.797 CM
 0.0 0.041 MR
 0.0 0.130 CM
 0.0 1.000 PC
 0.0 0.275 -0.999 -0.000 0.000 -0.574

ROTAT

2. 0.34922 DEG

70.953 -0.000 1222.982 FT 1225.367 FT
 0.0 2.270 CM
 0.0 0.487 MR
 0.0 0.797 CM
 0.0 0.041 MR
 0.0 0.130 CM
 0.0 1.000 PC
 0.0 0.275 -0.999 -0.000 0.000 -0.574

PEND

4. "B9A" 20.00000 FT 18.67998 KG

71.696 -0.000 1242.968 FT 1245.367 FT
 0.0 2.213 CM
 0.0 0.365 MR
 0.0 0.793 CM
 0.0 0.041 MR
 0.0 0.113 CM
 0.0 1.000 PC
 0.0 0.165 -0.999 -0.000 0.000 -0.711

RATT

2. 0.34922 DEG

71.696 -0.000 1242.968 FT 1245.367 FT
 0.0 2.213 CM
 0.0 0.365 MR
 0.0 0.793 CM
 0.0 0.041 MR
 0.0 0.113 CM
 0.0 1.000 PC
 0.0 0.165 -0.999 -0.000 0.000 -0.711

DRIFT

3. 1.50000 FT

71.732 -0.000 1244.467 FT 1246.867 FT
 0.0 2.210 CM
 0.0 0.365 MR
 0.0 0.793 CM
 0.0 0.041 MR
 0.0 0.113 CM
 0.0 1.000 PC
 0.0 0.158 -0.999 -0.000 0.000 -0.711

PEND

2. 0.34922 DEG

71.732 -0.000 1244.467 FT 1246.867 FT
 0.0 2.210 CM
 0.0 0.365 MR
 0.0 0.793 CM
 0.0 0.041 MR
 0.0 0.113 CM
 0.0 1.000 PC
 0.0 0.157 -0.999 -0.000 0.000 -0.711

PEND

4. "B9B" 20.00000 FT 18.67998 KG

72.222 -0.000 1264.461 FT 1266.867 FT
 0.0 2.189 CM
 0.0 0.243 MR
 0.0 0.789 CM
 0.0 0.041 MR
 0.0 0.099 CM
 0.0 1.000 PC
 0.0 0.076 -0.998 -0.000 0.000 -0.844

ROTAT

0.34922 DEG

72.222	-0.000	1264.461 FT	1266.867 FT	0.0 0.0 0.0 0.0 0.0 0.0	2.189 CM 0.243 MR 0.789 CM 0.041 MR 0.099 CM 1.000 PC	-0.075 -0.000 0.000 0.000 -0.000 -0.122 0.471 0.842 0.000 -0.000 0.075 -0.098 -0.000 0.000 -0.844
DRIFT	3.	1.50000 FT				
72.250	-0.000	1265.961 FT	1268.367 FT	0.0 0.0 0.0 0.0 0.0 0.0	2.188 CM 0.243 MR 0.789 CM 0.041 MR 0.099 CM 1.000 PC	-0.070 -0.000 0.000 0.000 -0.000 -0.120 0.476 0.842 0.000 -0.000 0.070 -0.098 -0.000 0.000 -0.844
EFTAT	2.	0.34922 DEG				
72.250	-0.000	1265.961 FT	1268.367 FT	0.0 0.0 0.0 0.0 0.0 0.0	2.188 CM 0.243 MR 0.789 CM 0.041 MR 0.099 CM 1.000 PC	-0.069 -0.000 0.000 0.000 -0.000 -0.122 0.476 0.843 0.000 -0.000 0.070 -0.098 -0.000 0.000 -0.844
BEND	4.	"B10 "	20.00000 FT	18.67998 KG	0.0	(0.69856 DEG)
72.496	-0.000	1285.959 FT	1288.367 FT	0.0 0.0 0.0 0.0 0.0 0.0	2.183 CM 0.122 MR 0.786 CM 0.041 MR 0.089 CM 1.000 PC	-0.022 -0.000 0.000 0.000 -0.000 -0.090 0.279 0.946 0.000 -0.000 0.019 -0.991 -0.000 0.000 -0.955
RCTAT	2.	0.34922 DEG				
72.496	-0.000	1285.959 FT	1288.367 FT	0.0 0.0 0.0 0.0 0.0 0.0	2.183 CM 0.122 MR 0.786 CM 0.042 MR 0.089 CM 1.000 PC	-0.020 -0.000 0.000 0.000 -0.000 -0.093 0.279 0.946 0.000 -0.000 0.019 -0.991 -0.000 0.000 -0.955
CPIFT	3.	1.50000 FT				
72.505	-0.000	1287.459 FT	1289.867 FT	0.0 0.0 0.0 0.0 0.0 0.0	2.183 CM 0.122 MR 0.786 CM 0.042 MR 0.089 CM 1.000 PC	-0.017 -0.000 0.000 0.000 -0.000 -0.090 0.281 0.946 0.000 -0.000 0.017 -0.991 -0.000 0.000 -0.955
ROTAT	2.	0.34922 DEG				
72.505	-0.000	1287.459 FT	1289.867 FT	0.0 0.0 0.0 0.0 0.0 0.0	2.183 CM 0.122 MR 0.786 CM 0.042 MR 0.089 CM 1.000 PC	-0.015 -0.000 0.000 0.000 -0.000 -0.093 0.281 0.947 0.000 -0.000 0.017 -0.991 -0.000 0.000 -0.955
BEND	4.	"B11 "	20.00000 FT	18.67998 KG	0.0	(0.69856 DEG)
72.507	-0.000	1307.459 FT	1309.867 FT	0.0 0.0 0.0	2.182 CM 0.016 MR 0.784 CM	-0.016 -0.000 -0.000

ROTATE

72.507 -0.000 1307.459 FT

13C9.867 FT

0.34922 DEG

0.0	0.784 CM	-0.000	-0.000
0.0	0.042 MR	-0.000	-0.000
0.0	0.085 CM	-0.004	-0.086
0.0	1.000 PC	0.000	0.000

2. *FIT* 10.0 "F8" -1. 6. 0.0 /0.00010 (0.00006)

TRANSFORM 1

-0.11298	3.11777	-0.00000	-0.00000
-0.32073	-0.00004	-0.00000	0.0
-0.00000	0.00000	0.0	0.000138
-0.00000	0.52839	1.27600	0.0
-0.00000	-0.83000	-0.00187	-0.30000
0.00002	-0.00042	0.00000	0.00000
0.0	0.0	0.0	-0.08467
0.0	0.0	0.0	1.00000

POINT 3. 47.31998 FT

72.224 -0.000 1354.778 FT

1357.187 FT

0.0 2.182 CM

0.0	0.016 MR	0.001
0.0	0.784 CM	-0.000
0.0	0.042 MP	-0.000
0.0	0.085 CM	-0.034
0.0	1.000 PC	0.000

QUAD

5.	"Q14"	10.00000 FT	4.94870 KG
----	-------	-------------	------------

72.164 -0.000 1364.778 FT

1367.187 FT

0.0 2.183 CM

0.0	0.016 MR	0.011
0.0	0.783 CM	-0.000
0.0	0.042 MR	-0.000
0.0	0.085 CM	-0.004
0.0	1.000 PC	0.001

POINT 3. 1.25000 FT

72.157	-0.000	1366.028 FT	1368.437 FT
--------	--------	-------------	-------------

0.0 2.043 CM

0.0	0.935 MR	-1.000
0.0	0.834 CM	-C.000
0.0	0.342 MR	0.000
0.0	0.085 CM	0.005
0.0	1.000 PC	0.001

QUAD

5.	"Q15"	10.00000 FT	4.94870 KG
----	-------	-------------	------------

72.097 -0.000 1376.027 FT

1378.437 FT

0.0 3.81000 CM

0.0	1.610 CM	-1.000
0.0	1.681 MR	-C.000
0.0	1.009 CM	0.000
0.0	0.731 MR	-0.000
0.0	0.085 CM	-0.005
0.0	1.000 PC	0.001

POINT 3. 1.25000 FT

72.089 -0.000 1377.277 FT

1379.687 FT

0.0 1.546 CM

0.0	1.681 MR	-1.000
0.0	1.036 CM	-C.000
0.0	0.731 MR	0.000
0.0	0.085 CM	-0.004
0.0	1.000 PC	0.000

QUAD

5. "Q16" 10.00000 FT -6.34965 KG

72.029	-0.000	1387.277 FT	1389.687 FT
0.0	1.036 CM	-0.000	0.000
0.0	0.731 MR	-0.000	0.999
0.0	0.085 CM	-0.005	0.004
0.0	1.000 PC	0.001	-0.000
			0.000 -1.000

DRIFT

3. 1.25000 FT

72.322	-0.000	1388.527 FT	1390.937 FT
0.0	1.150 CM	0.999	-0.999
0.0	0.958 MR	-0.000	0.000
0.0	1.168 CM	-0.000	0.000
0.0	0.125 MR	0.000	0.975
0.1	0.285 CM	-0.006	0.003
0.0	1.000 PC	0.002	0.000 -1.000

QUAD

5. "Q17" 10.00000 FT -6.34965 KG

71.962	-0.000	1398.527 FT	1400.936 FT
0.0	1.113 CM	-0.999	-0.999
0.0	0.958 MR	0.000	0.000
0.0	1.113 CM	-0.000	0.000
0.0	0.509 MR	-0.007	-0.001 -0.998
0.0	0.085 CM	-0.007	-0.001 -0.000 0.000
0.0	1.000 PC	0.003	0.005 0.000 -1.000

TRIFET

71.534	-0.000	1470.055 FT	1472.466 FT
0.0	0.907 CM	0.996	-0.996
0.0	0.416 MR	0.000	0.000
0.0	1.113 CM	-0.000	0.000
0.0	0.509 MR	-0.007	-0.001 -0.998
0.0	0.085 CM	-0.007	-0.001 -0.000 0.000
0.0	1.000 PC	0.003	0.005 0.000 -1.000

TRANSFORM 1

-1.68341	-0.00023	-0.00000	-0.00000	0.0	0.00725
-0.45865	-0.59406	-0.00000	-0.00000	0.0	0.00206
-0.00000	-0.00000	-1.27848	0.00028	0.0	0.00000
2.00000	0.00000	0.32397	-0.78224	0.0	0.00000
0.00002	-0.00042	0.00000	-0.00000	1.00000	-0.08467
0.0	0.0	0.0	0.0	0.0	1.00000

LNGTH

1472.46631 FT

- 30 -

TM-477
2254

TOTAL LENGTH = 1967.81FT TOTAL BEND = -62,68 MRAD TOTAL POWER = 3980,86KW